

## Modem Signal and Line States

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This chapter describes modem states in the following section:

- [Signal and Line State Diagrams](#)

To identify the hardware platform or software image information associated with a feature, use the Feature Navigator on Cisco.com to search for information about the feature or refer to the software release notes for a specific release. For more information, see the “Identifying Supported Platforms” section in the “Using Cisco IOS Software” chapter.

For a complete description of the modem support commands in this chapter, refer to the *Cisco IOS Modem Command Reference*. To locate documentation of other commands that appear in this chapter, use the command reference master index or search online.

## Signal and Line State Diagrams

The following signal and line state diagrams accompany some of the tasks in the following sections to illustrate how the modem control works:

- [Configuring Automatic Dialing](#)
- [Automatically Answering a Modem](#)
- [Supporting Dial-In and Dial-Out Connections](#)
- [Configuring a Line Timeout Interval](#)
- [Closing Modem Connections](#)
- [Configuring a Line to Disconnect Automatically](#)
- [Supporting Reverse Modem Connections and Preventing Incoming Calls](#)

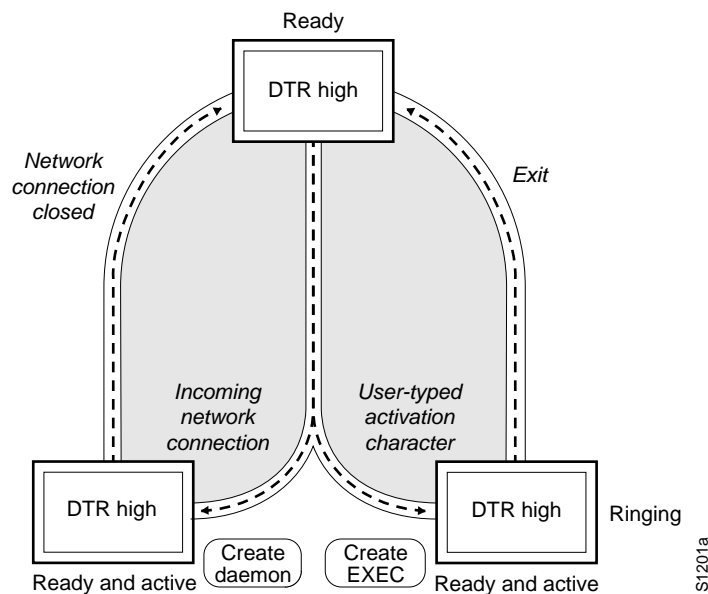
The diagrams show two processes:

- The “create daemon” process creates a tty daemon that handles the incoming network connection.
- The “create EXEC” process creates the process that interprets user commands. (See [Figure 25](#) through [Figure 29](#).)

In the diagrams, the current signal state and the signal the line is watching are listed inside each box. The state of the line (as displayed by the **show line EXEC** command) is listed next to the box. Events that change that state appear in italics along the event path, and actions that the software performs are described within ovals.

[Figure 25](#) illustrates line states when no modem control is set. The DTR output is always high, and CTS and RING are completely ignored. The Cisco IOS software starts an EXEC session when the user types the activation character. Incoming TCP connections occur instantly if the line is not in use and can be closed only by the remote host.

**Figure 25 EXEC and Daemon Creation on a Line with No Modem Control**



## Configuring Automatic Dialing

With the dialup capability, you can set a modem to dial the phone number of a remote router automatically. This feature offers cost savings because phone line connections are made only when they are needed—you pay for using the phone line only when there is data to be received or sent.

To configure a line for automatic dialing, use the following command in line configuration mode:

Command	Purpose
Router(config-line)# <b>modem dtr-active</b>	Configures a line to initiate automatic dialing.

Using the **modem dtr-active** command causes a line to raise DTR signal only when there is an outgoing connection (such as reverse Telnet, NetWare Asynchronous Support Interface (NASI), or DDR), rather than leave DTR raised all the time. When raised, DTR potentially tells the modem that the router is ready to accept a call.

## Automatically Answering a Modem

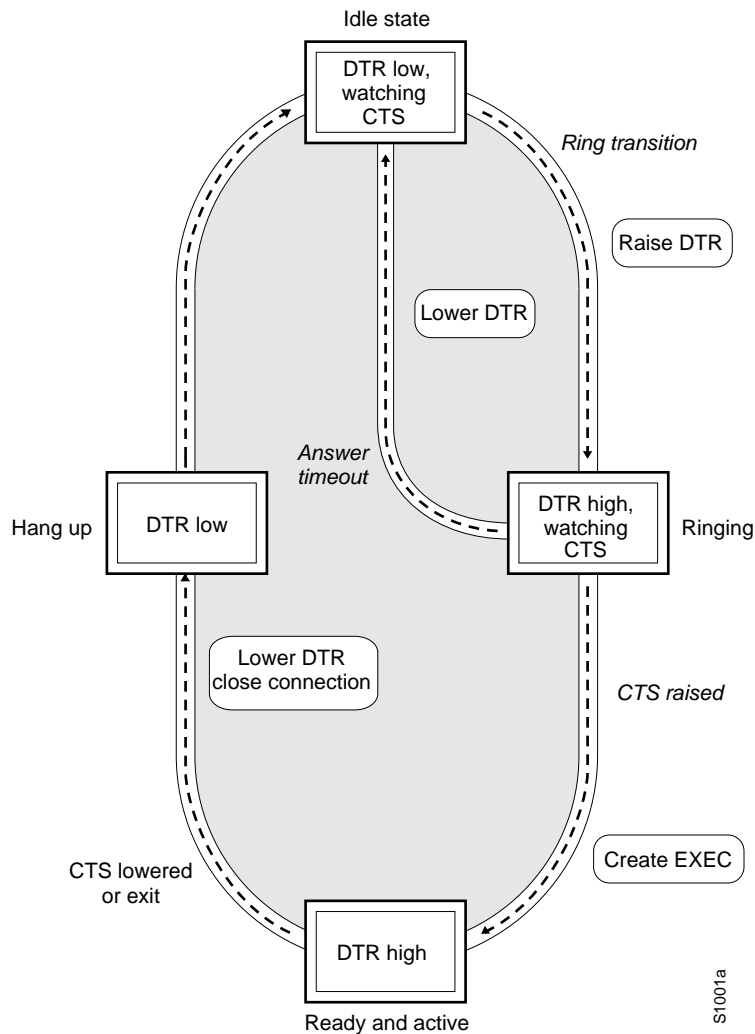
You can configure a line to answer a modem automatically. You also can configure the modem to answer the telephone on its own (as long as DTR is high), drop connections when DTR is low, and use its Carrier Detect (CD) signal to accurately reflect the presence of carrier. (Configuring the modem is a modem-dependent process.) First, wire the modem CD signal (generally pin-8) to the router RING input (pin-22), then use the following command in line configuration mode:

Command	Purpose
Router(config-line)# <b>modem dialin</b>	Configures a line to automatically answer a modem.

You can turn on modem hardware flow control independently to respond to the status of router CTS input. Wire CTS to whatever signal the modem uses for hardware flow control. If the modem expects to control hardware flow in both directions, you might also need to wire modem flow control input to some other signal that the router always has high, such as the DTR signal.

[Figure 26](#) illustrates the **modem dialin** process with a high-speed dialup modem. When the Cisco IOS software detects a signal on the RING input of an idle line, it starts an EXEC or autobaud process on that line. If the RING signal disappears on an active line, the Cisco IOS software closes any open network connections and terminates the EXEC facility. If the user exits the EXEC or the software terminates because of no user input, the line makes the modem hang up by lowering the DTR signal for 5 seconds. After 5 seconds, the modem is ready to accept another call.

Figure 26 EXEC Creation on a Line Configured for a High-Speed Modem



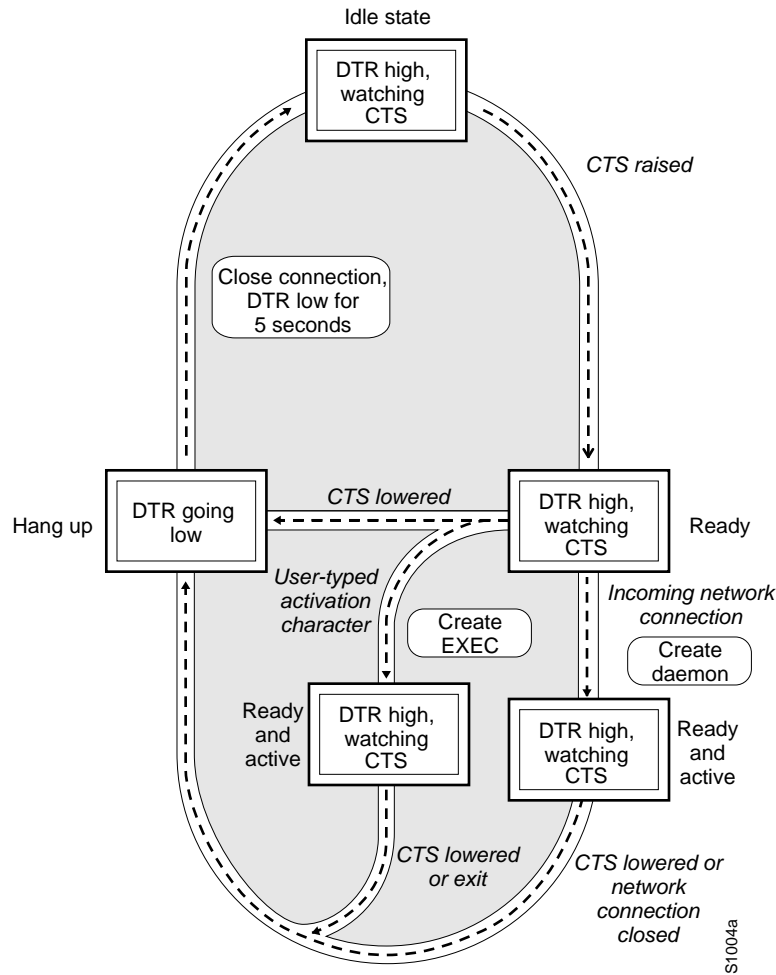
## Supporting Dial-In and Dial-Out Connections

To configure a line for both incoming and outgoing calls, use the following command in line configuration mode:

Command	Purpose
Router(config-line)# <b>modem inout</b>	Configures a line for both incoming and outgoing calls.

Figure 27 illustrates the **modem inout** command. If the line is activated by raising the data set ready (DSR) signal, it functions exactly as a line configured with the **modem dialin** line configuration command described in the section “[Automatically Answering a Modem](#)” earlier in this chapter. If the line is activated by an incoming TCP connection, the line functions similarly to lines not used with modems.

Figure 27 EXEC and Daemon Creation for Incoming and Outgoing Calls



Note

If your system incorporates dial-out modems, consider using access lists to prevent unauthorized use.

## Configuring a Line Timeout Interval

To change the interval that the Cisco IOS software waits for the CTS signal after raising the DTR signal in response to the DSR (the default is 15 seconds), use the following command in line configuration mode. The timeout applies to the **modem callin** command only.

Command	Purpose
Router(config-line)# <b>modem answer-timeout</b> <i>seconds</i>	Configures modem line timing.

Note

The DSR signal is called RING on older ASM-style chassis.

## Closing Modem Connections



### Note

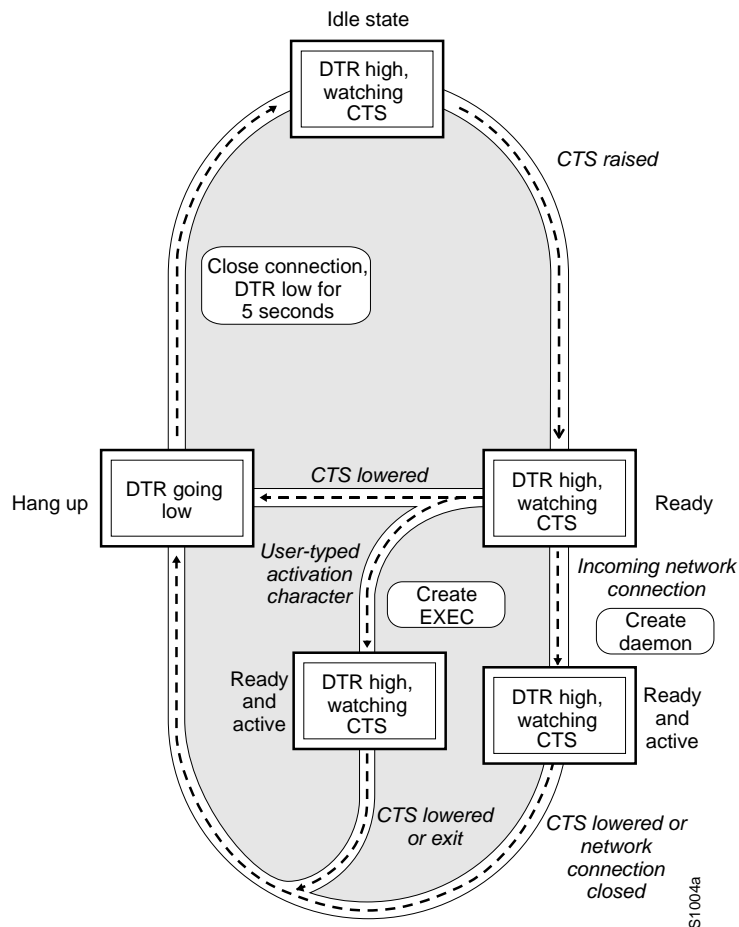
The **modem cts-required** command was replaced by the **modem printer** command in Cisco IOS Release 12.2.

To configure a line to close connections from a user's terminal when the terminal is turned off and to prevent inbound connections to devices that are out of service, use the following command in line configuration mode:

Command	Purpose
Router(config-line)# <b>modem cts-required</b>	Configures a line to close connections.

Figure 28 illustrates the **modem cts-required** command operating in the context of a continuous CTS signal. This form of modem control requires that the CTS signal be high for the entire session. If CTS is not high, the user input is ignored and incoming connections are refused (or sent to the next line in a rotary group).

Figure 28 EXEC and Daemon Creation on a Line Configured for Continuous CTS



## Configuring a Line to Disconnect Automatically

To configure automatic line disconnect, use the following command in line configuration mode:

Command	Purpose
Router(config-line)# <b>autohangup</b>	Configures automatic line disconnect.

The **autohangup** command causes the EXEC facility to issue the **exit** command when the last connection closes. This feature is useful for UNIX-to-UNIX copy program (UUCP) applications because UUCP scripts cannot issue a command to hang up the telephone. This feature is not used often.

## Supporting Reverse Modem Connections and Preventing Incoming Calls

In addition to initiating connections, the Cisco IOS software can receive incoming connections. This capability allows you to attach serial and parallel printers, modems, and other shared peripherals to the router or access server and drive them remotely from other modem-connected systems. The Cisco IOS software supports reverse TCP, XRemote, and local-area transport (LAT) connections.

The specific TCP port or socket to which you attach the device determines the type of service that the Cisco IOS software provides on a line. When you attach the serial lines of a computer system or a data terminal switch to the serial lines of the access server, the access server can act as a network front-end device for a host that does not support the TCP/IP protocols. This arrangement is sometimes called *front-ending* or *reverse connection mode*.

The Cisco IOS software supports ports connected to computers that are connected to modems. To configure the Cisco IOS software to function somewhat like a modem, use the following command in line configuration mode. This command also prevents incoming calls.

Command	Purpose
Router(config-line)# <b>modem callout</b>	Configures a line for reverse connections and prevents incoming calls.

[Figure 29](#) illustrates the **modem callout** process. When the Cisco IOS software receives an incoming connection, it raises the DTR signal and waits to see if the CTS signal is raised to indicate that the host has noticed the router DTR signal. If the host does not respond within the interval set by the **modem answer-timeout** line configuration command, the software lowers the DTR signal and drops the connection.

Figure 29 Daemon Creation on a Line Configured for Modem Dial-Out

